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Risk from drought and extreme heat in Russian wheat production and its relation to atmospheric blocking and teleconnection patterns

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Russia has become one of the leading wheat exporters worldwide. Major breakdowns in Russian wheat production induced by extreme weather events are therefore of high significance not only for the domestic but also for the global market. Wheat production in south-western Russia, the main growing area, suffers in particular from the adverse effects of drought and heat waves. For this reason knowledge of the occurrence of this type of extreme events and of the processes that lead to adverse conditions is of paramount importance for risk management.

The negative impacts of heat waves and drought are particularly severe when anomalous conditions persist in time. As an example, a blocking event in summer 2010 resulted in one of the warmest and worst drought conditions in Russia's recent history. The latter caused a decline in Russian wheat production by more than 30%, which in turn prompted the Russian government to issue an export ban that lasted until summer 2011. In view of this, the question of course arises of how much of the negative variations in Russian wheat production levels can be explained by blocking events and other features of the large-scale atmospheric circulation. Specific questions are: how often are blocking events over Russia associated with extreme high temperatures and dry conditions? Which of the teleconnection patterns are correlated with drought and heat stress conditions in the area? Answering these questions can contribute to a develop strategies for agricultural risk management.

In this contribution we present results of a study that aims at characterizing the occurrence of adverse weather conditions in south-western Russia in relation to atmospheric blocking and teleconnection patterns such as East Atlantic/Western Russia pattern, the Polar/Eurasia pattern, the North Atlantic Oscillation and the Scandinavia pattern. The analysis relies on weather data for 1980-2014 from 130 stations distributed across the wheat production area. The account for similarities in the occurrence of extreme heat, stations are clustered according to 90th percentile of daily maximum temperature. The results indicate that adverse conditions in the area are significantly correlated with the occurrence of blocking events and with the phase of some teleconnection patterns.